



Suitable for: RITTER Drum-type Gas Meters
Measuring Range: 0 to 10 mbar (over- / underpressure); also available:
 0 to 20 mbar
Resolution: 0.1 mbar

Application:

The Manometer can be used for measurement of the gas pressure while measuring the gas flow. Among other reasons, this is necessary if the measured and indicated **actual volume** of gas must be recalculated into the **norm volume**. The **actual** volume is the volume at the **actual** temperature and the **actual** pressure. The **norm volume** of a gas is the volume at **norm conditions** which are (in Germany):

Norm temperature = 273.15 Kelvin (= 0 °C)
 Norm pressure = 1,013.25 mbar

The formula for converting the **actual volume** into **norm volume** is:

$$V_N = V_i \times \frac{P_a}{P_N} \times \frac{T_N}{T_i} \quad \text{where}$$

V_N	=	<u>N</u> orm Volume in	[ltr]
V_i	=	<u>i</u> ndicated Volume in	[ltr]
p_N	=	<u>N</u> orm Pressure in	[mbar-absolute]
p_a	=	<u>a</u> ctual Pressure in	[mbar-absolute]
T_N	=	<u>N</u> orm Temperature in	[Kelvin]
T_i	=	<u>i</u> ndicated Temperature in	[Kelvin]

Note: The indicated gas pressure at the manometer is the differential pressure between the gas pressure at the gas inlet and the actual atmospheric air pressure. Thus, the actual gas pressure (p_a) of the above formula equals the **indicated gas pressure** at the Manometer **plus** the **actual atmospheric air pressure** in [mbar].

Installation:

Unpack the Manometer. Mount the Manometer into the Manometer support (see middle picture above). Unscrew the closing cap of the "Manometer Connection" port located at the "Gas Inlet" nozzle at the centre of the rear plate. The removed closing cap of the port can be stored easily by screwing it onto the respective thread support at the rear side of the Manometer. (See arrow in the

right-hand picture above.) Screw the closing cap, which is attached to the flexible Manometer pipe, tight to the "Manometer Connection" port.

Filling:

The Manometer must be filled unpressurised. It is to be filled with the blue Special-Equipment Filling Oil ("Spezial-Gerätefüllöl") provided with the Manometer. First remove the white thumb screw from the Filling Hole. Pour in the oil until the oil column reaches the "0"-mark at the adjustable scaled front plate (or until it comes close to the "0"-mark). If necessary, adjust the moveable plate to the exact liquid level by loosening the screw(s) and moving the plate.

Replace the white thumb screw. **Please note: Only the specially provided blue oil should be used with this Manometer** (Density 0.88)!! If the manometer is filled with an oil with a different density, the Manometer indication will inevitably be wrong.

Then, unscrew the closing cap of the "Manometer Connection" port located at the Gas Inlet nozzle (on the rear side of the Gas Meter casing). The removed closing cap of the port can be stored easily by screwing it onto the thread support on the rear of the Manometer (see arrow in the right-hand picture). Lastly, tightly screw the closing cap attached to the flexible Manometer tube, onto the "Manometer Connection" port.

The Manometer is then ready for use.

Prior to future measurements the correct position of the adjustable scaled front plate must be checked. For doing this, the manometer must be unpressurised. If the liquid level of the manometer column is not exactly at the "0"-mark of the adjustable scaled front plate, the plate must be adjusted accordingly.

Reading:

The oil column of the Manometer indicates the differential pressure in [mbar] of the gas between the Gas Inlet of the Gas Meter and the atmospheric pressure.

Caution: If the Manometer is connected to the gas inlet of the Gas Meter but **not** filled with oil, gas will leak through the Manometer. This will inevitably cause a **measurement error** of the Gas Meter.



- Suitable for:** RITTER Drum-type Gas Meters
- Measuring Range:** 0 - 4 mbar with oil filling ($\gamma = 0.88$)
 0 - 60 mbar with mercury filling ($\gamma = 13.85$)
 (both over- and underpressure)
- Resolution:** 0.1 mbar with oil filling ($\gamma = 0.88$)
 1 mbar with mercury filling ($\gamma = 13.85$)

Application:

The Manometer can be used for measurement of the gas pressure while measuring the gas flow. Among other reasons, this is necessary if the measured and indicated **actual volume** of gas must be recalculated into the **norm volume**. The **actual** volume is the volume at the **actual** temperature and the **actual** pressure. The **norm volume** of a gas is the volume at **norm conditions** which are (in Germany):

- Norm temperature = 273.15 Kelvin (= 0 °C)
 Norm pressure = 1,013.25 mbar

The formula for converting the **actual volume** into **norm volume** is:

$$V_N = V_i \times \frac{P_a}{P_N} \times \frac{T_N}{T_i}$$

where

- V_N = Norm Volume in [ltr]
- V_i = indicated Volume in [ltr]
- p_N = Norm Pressure in [mbar-absolute]
- p_a = actual Pressure in [mbar-absolute]
- T_N = Norm Temperature in [Kelvin]
- T_i = indicated Temperature in [Kelvin]

Note: The indicated gas pressure at the manometer is the differential pressure between the gas pressure at the gas inlet and the actual atmospheric air pressure. Thus, the actual gas pressure (p_a) of the above formula equals the **indicated gas pressure** at the Manometer **plus** the **actual atmospheric air pressure** in [mbar].

General:

The inclined tube manometer consists of a acrylic glass block 30 mm thick. The size of the board corresponds to the individual measuring range. The liquid container and the measuring column are built into this block. The measuring scale is adjustable, which allows for a quick and easy setting to zero point.

Installation:

Unpack the Manometer. Mount the Manometer to the Manometer support by screwing the two provided knurled screws to the support unit (see right-hand picture above). Unscrew the sealing plug of the "Manometer Connection" port located at the "Gas Inlet" nozzle at the centre of the rear plate. The removed sealing plug of the port can be stored easily by screwing it into the respective thread support at the rear side of the meter handle. Screw the hose tap nozzle, which is attached to the flexible pressure supply pipe, tight to the "Manometer Connection" port.

Adjusting of the manometer:

For exact horizontally adjusting each inclined tube manometer is provided with a bubble level. For easy adjusting there are two suspension eye hooks one of which is slot shaped. After releasing both the fixing screw on top of the manometer as well as the screw inside the slot, the manometer can be adjusted. After adjusting both screws must be fixed again.

Filling:

Filling is easily performed via the vertical left-hand connection port. If the manometer was not pre-mounted: Unscrew the yellow screw cap. Fill in the respective filling liquid (blue Special-Equipment Filling Oil [$\gamma = 0.88$] or mercury¹). For easier handling the hose barb nozzle can be removed.

Please note that only the liquid must be filled which the manometer is designed for!

Fill in the liquid until the liquid column inside the inclined tube is in the near of the zero mark. The liquid column must not be set perfectly to the zero mark, because the manometer scale is moveable. The "fine tuning" (= setting the zero mark perfectly to the end of the liquid column) can then be done by moving the scale up or down. The scale can be moved after releasing the white fixing knob (fixing screw) of the scale.

After the scale is moved into the correct position. the fixing knob **must** be fixed again.

Connection of the pressure supply pipe to the manometer:

Unscrew both yellow screw plugs on top of the manometer. The pressure supply pipe is to be provided with a hose tap nozzle. Screw this tap nozzle

- into the left-hand connection port if overpressure is to be measured,
- into the right-hand connection port if underpressure is to be measured.

The Manometer is then ready for use.

Operating:

Operate the manometer only within its pressure limits.

When operating the manometer, care should be taken that it is protected against radiant heat.

¹ The mercury version is labelled by the engraving „For Mercury Only“ at the front side.

Maintenance:

In general a special maintenance service is not necessary. But it is recommended to check the zero-point of the scale from time to time. If necessary, the scale must be re-adjusted or measuring liquid may have to be refilled.

Cleaning:

According to the degree of contamination cleaning agent M 3 is used. After the filling liquid was removed, M 3 is filled into the unit via the left-hand hose nozzle. Leave the cleaning agent there for some time to dissolve the contamination. If special filling oil $\gamma = 0,88$ has been used and the contamination is considerable, the cleaning process has to be repeated several times. Subsequently rinse well with pure warm water until the liquid container and the measuring column are clear again.